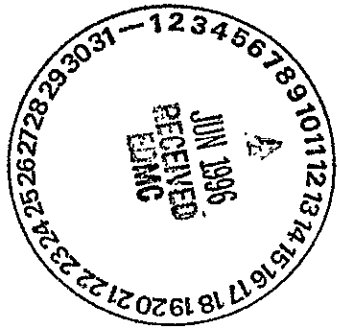
LK5440

0044408

Lockheed Environmental Systems & Technologies Co.
Lockheed Analytical Services
975 Kelly Johnson Drive Las Vegas, Nevada 89119-3705
Telephone 702-361-0220 800-582-7605 Facsimile 702-361-8146

LOCKHEED MARTIN



November 9, 1995

Ms. Joan Kessner
Bechtel Hanford, Inc.
345 Hills
P.O. Box 969
Richland, WA 99352

RE:	Log-in No.:	L5440
	Quotation No.:	Q400000-B
	SAF:	B95-099
	Document File No.:	0926596
	WHC Document File No.:	276
	SDG No.:	LK5440

The attached data report contains the analytical results of samples that were submitted to Lockheed Analytical Services on 26 September 1995.

The temperature of the cooler upon receipt was 5°C. Sample containers received agree with the chain-of-custody documentation. Sample containers were received intact. Samples were received in time to meet the analytical holding time requirements. The vials for volatile analyses did not contain headspace. All discrepancies identified upon receipt of the samples have been forwarded to the client and are documented in the enclosed chain-of-custody records. (See attached Sample Receiving Checklist).

The case narratives included in the following attachments provide a detailed description of all events that occurred during sample preparation, analysis, and data review specific to the samples and analytical methods requested.

A list of data qualifiers, chain-of-custody forms, sample receiving checklist, and log-in report are also enclosed representing the samples received within this group.

If you have any questions concerning the analysis or the data please call Kathleen Hall at (509) 375-4741.

Lockheed Analytical Services

Log-in No.: L5440
Quotation No.: Q400000-B
SAF: B95-099
Document File No.: 0926596
WHC Document File No.: 276
SDG No.: LK5440

Release of this data report has been authorized by the Laboratory Director or the Director's designee as evidenced by the following signature.

" I certify that this data package is in compliance with the SOW, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the Laboratory Manger or a designee, as verified by the following signature."

Sincerely,

Karen Hermann for

Kathleen M. Hall
Client Services Representative

cc: Client Services
Document Control

CASE NARRATIVE
INORGANIC NON METALS ANALYSES
WATER

The routine calibration and quality control analyses performed for this batch include as applicable: initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), matrix spike sample(s), and duplicate sample(s).

Preparation and Analysis Requirements

- One water sample was received for LK5440 and analyzed in batches 926 bh for selected analytes as requested on the chain of custody. Quality control analysis was performed on the following sample:

Client ID	LAL #		Method
BOGKN5	L5440-9	MS, DUP	300.0 Chloride, Fluoride, Nitrate-Nitrogen, Orthophosphate, Sulfate
	L5440-10	MS, DUP	950.1 Ammonia
	L5440-11	MS, DUP	9030 Sulfide

Holding Time Requirements

- All samples were analyzed within the method-specific holding time with the exception of Method 300.0 Nitrate-Nitrogen and Orthophosphate which were received outside of holding time. The associated samples are flagged with an "H".

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits.

Kay McCann
Prepared By

October 15, 1995
Date

CASE NARRATIVE
INORGANIC METALS ANALYSES

The routine calibration and quality control analyses performed for this batch include as applicable: instrument tune (ICP/MS only), initial and continuing calibration verification, initial and continuing calibration blanks, method blank(s), laboratory control sample(s), ICP interference check samples (ICP only), serial dilutions, analytical (post-digestion) spike samples, matrix spike (predigestion) sample(s), duplicate sample(s).

Preparation and Analysis Requirements

All samples were received on September 26, 1995. The samples were logged in as L5440 and were prepared and analyzed in batch 926 bhT for total metals and 926 bhD for dissolved metals.

Holding Time Requirements

- All samples were analyzed within the method-specific holding times.

Method Blanks

- The concentration levels of all the requested analytes in the method blank were below the reporting detection limits.

Internal Quality Control

- All Internal Quality Control were within acceptance limits with the following exceptions: The matrix spike recoveries for thallium for both total (70%) and dissolved (72%) were outside of acceptance limits. The recoveries based on the LCS (91% total and 103.4 dissolved) support that the analytical system was operating within control limits.

Shellee McGrath
Prepared By

November 1, 1995
Date

CASE NARRATIVE
ORGANIC ANALYSES

Analytical Method 8240

The associated samples were analyzed in two analytical batches.

Analytical Batch 100295-8260-E1,E2

The samples were analyzed within the required holding time on October 2 and 3, 1995. The instrument tunes, initial and continuing calibrations were within QC criteria. There were no target compounds detected in the Method Blank (MB). Surrogate recoveries were within QC limits. Compound recoveries were within QC limits in the Matrix Spike (MS), Matrix Spike Duplicate (MSD), and Laboratory Control Sample (LCS). The Relative Percent Differences (RPDs) between the MS and MSD recoveries were within QC limits. All samples met internal standard area counts and retention times criteria.

Christine Davy
Prepared By

November 9, 1995
Date

CASE NARRATIVE
RADIOCHEMICAL ANALYSES

The routine calibration and quality control (QC) analyses performed for this batch include as applicable: instrument calibration, initial and continuing calibration verification, quench monitoring standards, instrument background analysis, method blanks, yield tracer, laboratory control samples, matrix spike samples, duplicate samples.

NOTE: Chemical recoveries and minimum detectable activities can be found on the preparation sheets and calculation sheets on the attached raw data for each method.

Holding Time Requirements

All holding times were met.

Analytical Method Gross Alpha Beta

The gross alpha beta analysis was performed using standard operating procedure, LAL-91-SOP-0060. The samples were analyzed in workgroup 27812. No problems were encountered during the analysis and all QC criteria were met with the following exceptions: The minimum detectable activity of the matrix spike and duplicate (27812MS1 and 27812DUP1) was greater than the reporting detection limit due to residue weight limitations forcing a volume reduction. Data quality is not believed to be adversely affected. No re-analyses were performed.

Yvonne M. Jacoby
Prepared By

October 20, 1995
Date

Lockheed Analytical Services
DATA QUALIFIERS FOR INORGANIC ANALYSES
[Revised 08/28/92]

For Use on the Analytical Data Reporting Forms	
B	***For CLP Analyses Only*** -- Reported value is less than the contract required detection limit (CRDL) but greater than or equal to the instrument detection limit (IDL).
C	***For Routine, Non-CLP Analyses Only*** -- Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL).
D	Presence of high levels of interfering constituents required dilution of sample which increased the RDL by the dilution factor.
E	Estimated value due to presence of interference.
H	Sample analysis performed outside of method-or client-specified maximum holding time requirement.
M	***For CLP Analyses Only*** -- Duplicate injection precision criterion was not met.
N	Matrix spike recovery exceeded acceptance limits.
S	Reported value was determined from the method of standard addition.
U	***For CLP Reporting Only*** -- Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
W	***For AAS Only*** -- Post-digestion spike for Furnace AAS did not meet acceptance criteria and sample absorbance is less than 50% of spike absorbance.
X, Y, or Z	Analyst-defined qualifier.
*	Relative percent difference (RPD) for duplicate analysis exceeded acceptance limits.
+	Correlation coefficient (r) for the MSA is less than 0.995.
For Use on the QC Data Reporting Forms	
a[1]	The spike recovery and/or RPD for matrix spike and matrix spike duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the RDL.

[1] Used as footnote designations on the QC summary form.

Lockheed Analytical Services
DATA QUALIFIERS FOR ORGANIC ANALYSES

[Revised 04/12/1995]

For Use On The Analytical Data Reporting Forms	
A	***For CLP analyses Only*** -- The TIC is a suspected aldol-condensation product.
B	Any constituent that was also detected in the associated blank whose concentration was greater than the practical or reporting detection limit (PQL or RDL).
C	Constituent confirmed by GC/MS analysis. *[pesticide/PCB analyses only]*
D	Constituent detected in the diluted sample. It also indicates that an accurate quantitation is not possible due to surrogates being diluted out of the samples during the course of the analysis.
E	Constituent concentration exceeded the calibration range.
G	The quantitation is not gasoline or diesel but believed to be some other combination of hydrocarbons.
H	Sample analysis performed outside of method- or client-specified maximum holding time requirement.
J	*Estimated value* -- (1) constituent detected at a level less than the RDL or PQL and greater than or equal to the MDL; (2) estimated concentration for TICs ***(For CLP Reporting Only)***.
N	***For CLP Reporting Only*** -- Tentatively identified constituents (TICs) identified based on mass spectral library search.
P	***For CLP Reporting Only*** -- The percent difference between the concentrations detected on both GC columns was greater than 25 percent *[pesticide/PCB analyses only]*.
U	***For CLP Reporting Only*** -- Constituent was analyzed for but not detected (sample quantitation must be corrected for dilution and percent moisture).
X, Y, or Z	Analyst-defined qualifier.
N/A (% Moisture)	N/A in the % moisture cell indicates that data are reported on an "*as received*" basis. A value in the % moisture cell indicates that data are reported based on a "*dry weight*" basis.
For Use On The QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for matrix spike, matrix spike duplicate, laboratory control standard, or surrogates; and RPD for matrix spike duplicate or unspiked duplicate) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and matrix spike duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the RDL.

[1] Used as footnote designations on the QC Summary Form.

Lockheed Analytical Services

DATA QUALIFIERS FOR RADIOCHEMICAL ANALYSES

[Revised 08/28/92]

For Use on the Analytical Data Reporting Forms	
B	Any constituent that was also detected in the associated blank whose concentration was greater than the reporting detection limit (RDL) and/or minimum detectable activity (MDA).
C	Presence of high TDS in sample required reduction of sample size which increased the MDA.
D	Constituent detected in the diluted sample.
E	Constituent concentration exceeded the calibration or attenuation curve range.
F	***For Alpha Spectrometry Only***-- FWHM exceeded acceptance limits.
H	Sample analysis performed outside of method-specified maximum holding time requirement.
Y	Chemical yield exceeded acceptance limits.
For Use on the QC Data Reporting Forms	
*	QC data (i.e., percent recovery data for laboratory control standard and matrix spike; and RPD for replicate analyses) exceeded acceptance limits.
a[1]	The spike recovery and/or RPD for matrix spike and duplicates cannot be evaluated due to insufficient spiking level compared to the elevated sample analyte concentration.
b[1]	The RPD cannot be computed because the sample and/or duplicate concentration was below the MDA.

[1] Used as foot note designations on the QC summary form.

SAMPLE LOGIN AND CHAIN OF CUSTODY

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Sep 26 1995, 03:11 pm

Login Number: L5440
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
L5440-1	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG01-43D					
Water 1 S SCREENING		Hold: 21-MAR-96			
L5440-2	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
Water 1 S 8240 VOLATILES		Hold: 07-OCT-95			
L5440-3	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
L5440-4	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
L5440-5	BOGKN7	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
Water 1 S 8240 VOLATILES		Hold: 07-OCT-95			
L5440-6	BOGKN7	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
L5440-7	BOGKN7	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG18-48A6					
L5440-8	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5 "GFAA METALS=As,Pb,Se,Tl"					
Location: RFG02-22A					
Water 1 S 6010 ICP METALS		Hold: 21-MAR-96			
Water 1 S 7000 FURNACE METALS		Hold: 21-MAR-96			
L5440-9	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG02-22A					
Water 1 S 300.0 CHLORIDE		Hold: 21-OCT-95			
Water 1 S 300.0 FLUORIDE		Hold: 21-OCT-95			
Water 1 S 300.0 NITRATE		Hold: 25-SEP-95			
Water 1 S 300.0 PHOSPHATE		Hold: 25-SEP-95			

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09265946

LOCKHEED ANALYTICAL SERVICES
LOGIN CHAIN OF CUSTODY REPORT (ln01)
Sep 26 1995, 03:11 pm

Login Number: L5440
Account: 596 Bechtel Hanford, Inc. * Richland, WA
Project: BECHTEL-HANFORD Bechtel Hanford Project

Laboratory Sample Number	Client Sample Number	Collect Date	Receive Date	PR	Due Date
Water 1 S 300.0 SULFATE		Hold:21-OCT-95			
L5440-10	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG02-22A					
Water 1 S 350.1 NH3/N		Hold:21-OCT-95			
L5440-11	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: RFG02-22A					
Water 1 S 9030 SULFIDE		Hold:30-SEP-95			
L5440-12	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: 157					
Water 1 S GR ALP/BETA LAL-0060		Hold:21-MAR-96			
Water 1 S U TOTAL KPA (INORG)		Hold:21-MAR-96			
L5440-13	BOGKN5	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5					
Location: 157					
L5440-14	BOGKN6	23-SEP-95	26-SEP-95		31-OCT-95
TEMP 5 "GFAA METALS=As,Pb,Se,Tl"					
Location: RFG02-22A					
Filt H20 15 S 6010 ICP METALS		Hold:21-MAR-96			
Filt H20 15 S 7000 FURNACE METALS		Hold:21-MAR-96			
L5440-15	REPORT TYPE	26-SEP-95	26-SEP-95		31-OCT-95
Location:					
Water 1 S EDD - DISK DEL.					
Water 1 S GCMS2					
Water 1 S INORG TYPE 2 RPT +					
Water 1 S RAD RPT TYPE 2					

Signature: Paul C Day

Date: 9-26-95 000010

09260596

Bechtel Hanford, Inc.	CHAIN OF CUSTODY/SAMPLE ANALYSIS REQUEST L5440	Page 1 of 1

Collector: K Lee / D. St. John	Company Contact: M. J. Galgoul	Telephone: (509) 372-9597
Project Designation: 300-FF-2 618-10 and 618-11 Burial Ground Wells	Sampling Location: 618-10 and 618-11 Burial Grounds	SAF No.: B95-099
Ice Chest No.: GWS-025	Field Logbook No.: EFL-1123	Method of Shipment: Federal Express
Shipped To: Lockheed	Offsite Property No.: W95-0-0600-02	Bill of Lading/Air Bill No.: 2904641941

Data Turnaround: ☐ Priority ■ Normal

Possible Sample Hazards/Remarks

Special Handling and/or Storage: Maintain samples between 2°C and 6°C.

				HCl	HNO_3	Cool 4°C	H_2SO_4	*1	HNO_3	None		HNO_3	
Type of Container				Gs	P/G	P/G	P/G	P	P/G	P/G		P/G	
No. of Container(s)				3	1	1	1	1	~~2~~ 1 STC 9/23/95	1		1	
Volume				40mL	1L	500mL	1L	1L	~~250mL~~ *2 STC 9/23/95	20mL		1L	
SAMPLE ANALYSIS				VOA - TCL	ICP Metals (unfiltered) - TAL, GFAA Metals - As, Pb, Se, Tl	Anions (IC) - F, Cl, SO_4, NO_3, PO_4	Ammonia	Sulfide	Gross Alpha, Gross Beta, Total U	Activity Scan		ICP Metals (filtered) - TAL, GFAA Metals - As, Pb, Se, Tl	
Sample No.	Matrix*	Date Sampled	Time Sampled										
B0GKN5	W	9/23/95	1420	X	X	X	X	X	X	X			
B0GKN6	W	9/23/95	1420									X	
B0GKN7	W	9/23/95	1420	X									

CHAIN OF POSSESSION	Sign/Print Names		
Relinquished By: D.St.John [signature] ERC	Date/Time: 09-25-95 0855	Received By: [signature] B.Whitten ERC	Date/Time: 9-25-95 0855
Relinquished By: [signature] B.Whitten ERC	Date/Time: 9-25-95 0859	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time
Relinquished By	Date/Time	Received By	Date/Time

SPECIAL INSTRUCTIONS

*1 ZnAc + NaOH

*2 1, 1L and 1, ~~60mL~~ 250mL 9/23/95

Sample analysis for nitrate and phosphate by EPA 300.0 is being requested for information only. The ERC Contractor acknowledges that the 48-hour holding time will not be met.

Matrix*: S = Soil, SE = Sediment, SO = Solid, SL = Sludge, W = Water, O = Oil, A = Air, DS = Drum Solids, DL = Drum Liquids, T = Tissue, WI = Wipe, L = Liquid, V = Vegetation, X = Other

LABORATORY SECTION	Received By: [signature]	Title: Sample Custodian	Date/Time: 9-26-95 0900
FINAL SAMPLE DISPOSITION	Disposal Method	Disposed By	Date/Time

000011

Environmental Restoration Contractor **ERC Team**

Interoffice Memorandum

Job No. 22192
Written Response Required: NO
CCN: N/A
OU: 300 FF-2
TSD: N/A
ERA: N/A
Subject Code: 5830

TO: W. S. Thompson N3-06

DATE: September 20, 1995

COPIES: J. E. Parsons X0-23
M. J. Galgoul H6-01

FROM: S. K. De Mers
Radiological Controls
T7-05/373-1913

SUBJECT: **Sampling of Wells 699-S6-E4A, E4B, and E4C and Wells 699-12-4D and 699-13-1A&B**

There is no need to perform total activities prior to offsite shipment to NRC licensed labs of samples taken from these wells.

The wells were reviewed for radiological content based on the previous sampling data. Additionally, other wells in the same local were reviewed as recent sampling data is not available for all wells. The wells listed have a β activity $<100,000$ pCi/l ($<.1$ uCi/sample based on a 1 liter sample size) and the α activity is $<10,000$ pCi/l ($<.01$ uCi/l based on a 1 liter sample). The well shows activities $<$ 2,000 pCi/gm ($<$ 2 nCi/gm D.O.T. limit). The highest activity in recent samples is 36,600 pCi/l $\beta(H^3)$ and 15 pCi/l α. Other wells in the vicinity showed a recent high of 86,000 pCi/l of Tritium. While this value exceeds the drinking water limit, it does not exceed the limit for DOT shipping.

None of the wells reviewed are located within radiological areas and will not require any RCT support.

skd

09265

SAMPLE CHECK-IN LIST

Date/Time Received: 9-26-95/9:00am SDG#: n/a

Work Order Number: n/a SAF #: R95-099

Shipping Container ID: GWS-025 Chain of Custody # n/a

1. Custody Seals on shipping container intact? Yes [X] No [ ]
2. Custody Seals dated and signed? Yes [X] No [ ]
3. Sample temperature 5°C
4. Vermiculite/packing materials is Wet [ ] Dry [X]
5. Each sample is in a plastic bag? Yes [X] No [ ]
6. Sample holding times exceeded? Yes [X] No [ ]

7. Samples have:
   - ____ tape
   - X custody seals
   - ____ hazard labels
   - ____ appropriate sample labels

8. Samples are:
   - X in good condition
   - ____ broken
   - ____ leaking
   - ____ have air bubbles

9. Is the information on the COC and Sample bottles in agreement?

Yes[ ] No [X]

Notes: Holding Time for 300.0 Nitrate was passed

Sample Custodian/Laboratory: Paula Davis/Lockheed Date: 9-26-95

Telephoned To: _____ On _____ By _____

09506596

LOCKHEED MARTIN

Sample Login
Login Review Checklist

Lot Number L5440

The login review should be conducted by that person logging in the samples as well as a peer. Please use this checklist to ensure that such reviews occur in a uniform basis. Please sign and date below to verify that a login review has occurred. This checklist should be affixed to each login package prior to distribution.

For effective login review, at a minimum, five reports form the login process are required. These are the COC (or equivalent), the login COC report, the sample summary report, the sample receiving checklist, and the login quotation. Before beginning review, ensure that these five components are available. Jobs with single component samples, the sample summary report may be omitted.

SAMPLE SUMMARY REPORT	YES	NO	N/A	Comment
1. Are all sample ID's correct?	X			
2. Are all samples present?	X			
3. Are all matrices indicated correctly?	X			
4. Are all analyses on the COC logged in for the appropriate samples?	X			
5. Are all analyses logged in for the correct container?	X			
6. Are samples logged in according to LAS batching procedures?	X			

LOGIN CHAIN OF CUSTODY	YES	NO	N/A	Comment
1. Are the collect, receive, and due dates correct for every sample?	X			
2. Have all appropriate comments been indicated in the comment section?			X	

SAMPLE RECEIVING CHECKLIST	YES	NO	N/A	Comment
1. Are all discrepancies between the COC and the login noted (if applicable)?			X	

[signature] 9-26-95 [signature] 9-26-95

primary review signature — date — secondary review signature — date

000014

C9J26594

(80 464) 941

Lockheed Analytical Services
Sample Receiving Checklist

Client Name: Westinghouse - Hanford   Job No. L5440   Cooler ID: N/A

COOLER CONDITION UPON RECEIPT

Temperature of cooler upon receipt: 5°C

temperature of temp. blank upon receipt: —

	Yes	No	* Comments/Discrepancies
custody seals intact	X		
chain of custody present	X		
blue ice (or equiv.) present/frozen	X		
rad survey completed	X		

SAMPLE CONDITION UPON RECEIPT

	Yes	No	* Comments/Discrepancies
all bottles labeled	X		
samples intact	X		
proper container used for sample type	X		
sample volume sufficient for analysis	X		
proper pres. indicated on the COC	X		
VOA's contain headspace		X	
are samples bi-phasic (if so, indicate sample ID'S):		N/A	

MISCELLANEOUS ITEMS

	Yes	No	* Comments/Discrepancies
samples with short holding times	X		300.0 Nitrate, passed Holding Time.
samples to subcontract		N/A	

ADDITIONAL COMMENTS/DISCREPANCIES

Completed by / date: Paula Davis 9-26-95

Sent to the client (date/initials):   ** Client's signature upon receipt:

*Notes: * = contact the appropriate CSR of any discrepancies immediately upon receipt*

*** = please review this information and return via facsimile to the appropriate CSR (702) 361-8146*

0000015

version 2.0 (11/11/94)

E9606596

Lockheed Analytical Laboratory
SAMPLE SUMMARY REPORT (su02)
Bechtel Hanford, Inc. * Richland, WA

Client Sample Number	LAL Sample Number	SDG Number	Matrix	Method
BOGKN5	L5440-1		Water	SCREENING
	L5440-2		Water	8240 VOLATILES
	L5440-8		Water	6010 ICP METALS
	L5440-8		Water	7000 FURNACE META
	L5440-9		Water	300.0 CHLORIDE
	L5440-9		Water	300.0 FLUORIDE
	L5440-9		Water	300.0 NITRATE
	L5440-9		Water	300.0 PHOSPHATE
	L5440-9		Water	300.0 SULFATE
	L5440-10		Water	350.1 NH3/N
	L5440-11		Water	9030 SULFIDE
	L5440-12		Water	GR ALP/BETA LAL-(
	L5440-12		Water	U TOTAL KPA (INOF
BOGKN6	L5440-14		Filt H20	6010 ICP METALS
	L5440-14		Filt H20	7000 FURNACE META
BOGKN7	L5440-5		Water	8240 VOLATILES
REPORT TYPE	L5440-15		Water	EDD - DISK DEL.
	L5440-15		Water	GCMS2
	L5440-15		Water	INORG TYPE 2 RPT
	L5440-15		Water	RAD RPT TYPE 2

0926596

LOCKHEED ANALYTICAL SERVICES

COMMON IONS AND ADDITIONAL ANALYTES

Sample Results

Client Sample ID: BOGKN5	Date Collected: 23-SEP-95
Matrix: Water	Date Received: 26-SEP-95

Constituent	Units	Method	Result	Reporting Det Limit	Data Qualifier(s)	Date Analyzed	LAS Batch ID	LAS Sample ID
Chloride	mg/L	300.0	11.	0.02		28-SEP-95	27883	L5440-9
Fluoride	mg/L	300.0	0.27	0.1		02-OCT-95	27884	L5440-9
Nitrate-N	mg/L	300.0	5.8	0.02	H	28-SEP-95	27885	L5440-9
Ortho Phosphate	mg/L	300.0	< 0.1	0.1	H	02-OCT-95	27886	L5440-9
Sulfate	mg/L	300.0	47.	0.1		28-SEP-95	27887	L5440-9
Ammonia Nitrogen	mg/L	350.1	< 0.05	0.05		29-SEP-95	27888	L5440-10
Sulfide	mg/L	9030	< 3	3		28-SEP-95	27876	L5440-11

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGKN5	Date Collected: 23-SEP-95
Matrix: Water	Date Received: 26-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	IDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, TOTAL	mg/L	6010	< 0.021	0.021	0.20	U	1	24-OCT-95	28809	L5440-8
ANTIMONY, TOTAL	mg/L	6010	< 0.051	0.051	0.060	U	1	24-OCT-95	28809	L5440-8
BARIUM, TOTAL	mg/L	6010	0.049	0.014	0.20	B	1	24-OCT-95	28809	L5440-8
BERYLLIUM, TOTAL	mg/L	6010	< 0.0010	0.0010	0.0050	U	1	24-OCT-95	28809	L5440-8
CADMIUM, TOTAL	mg/L	6010	< 0.0050	0.0050	0.0050	U	1	24-OCT-95	28809	L5440-8
CALCIUM, TOTAL	mg/L	6010	48.	0.026	5.0		1	24-OCT-95	28809	L5440-8
CHROMIUM, TOTAL	mg/L	6010	0.0046	0.0040	0.010	B	1	24-OCT-95	28809	L5440-8
COBALT, TOTAL	mg/L	6010	< 0.0060	0.0060	0.050	U	1	24-OCT-95	28809	L5440-8
COPPER, TOTAL	mg/L	6010	< 0.0030	0.0030	0.025	U	1	24-OCT-95	28809	L5440-8
IRON, TOTAL	mg/L	6010	0.44	0.0090	0.10		1	24-OCT-95	28809	L5440-8
MAGNESIUM, TOTAL	mg/L	6010	13.	0.038	5.0		1	24-OCT-95	28809	L5440-8
MANGANESE, TOTAL	mg/L	6010	0.0021	0.0020	0.015	B	1	24-OCT-95	28809	L5440-8
NICKEL, TOTAL	mg/L	6010	< 0.014	0.014	0.040	U	1	24-OCT-95	28809	L5440-8
POTASSIUM, TOTAL	mg/L	6010	6.4	0.52	5.0		1	24-OCT-95	28809	L5440-8
SILVER, TOTAL	mg/L	6010	< 0.0030	0.0030	0.010	U	1	24-OCT-95	28809	L5440-8
SODIUM, TOTAL	mg/L	6010	17.	0.046	5.0		1	24-OCT-95	28809	L5440-8
VANADIUM, TOTAL	mg/L	6010	0.010	0.0040	0.050	B	1	24-OCT-95	28809	L5440-8
ZINC, TOTAL	mg/L	6010	0.012	0.0030	0.020	B	1	24-OCT-95	28809	L5440-8
ARSENIC, Total	mg/L	7060	0.0061	0.0040	0.010	BW	1	26-OCT-95	28810	L5440-8
LEAD, TOTAL	mg/L	7421	< 0.0010	0.0030	0.0030	U	1	26-OCT-95	28810	L5440-8
SELENIUM, TOTAL	mg/L	7740	< 0.0030	0.0030	0.0050	U	1	26-OCT-95	28810	L5440-8
THALLIUM, TOTAL	mg/L	7840	0.0040	0.0040	0.010	NWU	1	27-OCT-95	28810	L5440-8

LOCKHEED ANALYTICAL SERVICES

Sample Results

Client Sample ID: BOGKN6	Date Collected: 23-SEP-95
Matrix: Filt H20	Date Received: 26-SEP-95
Percent Solids: N/A	

Constituent	Units	Method	Result	IDL	RDL	Data Qual	Dilution	Date Analyzed	LAS Batch ID	LAS Sample ID
ALUMINUM, DISSOLVED	mg/L	6010	< 0.021	0.021	0.20	U	1	24-OCT-95	28790	L5440-14
ANTIMONY, DISSOLVED	mg/L	6010	0.064	0.051	0.060		1	24-OCT-95	28790	L5440-14
BARIUM, DISSOLVED	mg/L	6010	0.052	0.014	0.20	B	1	24-OCT-95	28790	L5440-14
BERYLLIUM, DISSOLVED	mg/L	6010	< 0.0010	0.0010	0.0050	U	1	24-OCT-95	28790	L5440-14
CADMIUM, DISSOLVED	mg/L	6010	< 0.0050	0.0050	0.0050	U	1	24-OCT-95	28790	L5440-14
CALCIUM, DISSOLVED	mg/L	6010	54.	0.026	5.0		1	24-OCT-95	28790	L5440-14
CHROMIUM, DISSOLVED	mg/L	6010	< 0.0040	0.0040	0.010	U	1	24-OCT-95	28790	L5440-14
COBALT, DISSOLVED	mg/L	6010	< 0.0060	0.0060	0.050	U	1	24-OCT-95	28790	L5440-14
COPPER, DISSOLVED	mg/L	6010	< 0.0030	0.0030	0.025	U	1	24-OCT-95	28790	L5440-14
IRON, DISSOLVED	mg/L	6010	< 0.0090	0.0090	0.10	U	1	24-OCT-95	28790	L5440-14
MAGNESIUM, DISSOLVED	mg/L	6010	14.	0.038	5.0		1	24-OCT-95	28790	L5440-14
MANGANESE, DISSOLVED	mg/L	6010	< 0.0020	0.0020	0.015	U	1	24-OCT-95	28790	L5440-14
NICKEL, DISSOLVED	mg/L	6010	< 0.014	0.014	0.040	U	1	24-OCT-95	28790	L5440-14
POTASSIUM, DISSOLVED	mg/L	6010	6.5	0.52	5.0		1	24-OCT-95	28790	L5440-14
SILVER, DISSOLVED	mg/L	6010	0.0030	0.0030	0.010	B	1	24-OCT-95	28790	L5440-14
SODIUM, DISSOLVED	mg/L	6010	18.	0.046	5.0		1	24-OCT-95	28790	L5440-14
VANADIUM, DISSOLVED	mg/L	6010	0.0093	0.0040	0.050	B	1	24-OCT-95	28790	L5440-14
ZINC, DISSOLVED	mg/L	6010	< 0.0030	0.0030	0.020	U	1	24-OCT-95	28790	L5440-14
ARSENIC, DISSOLVED	mg/L	7060	0.0057	0.0040	0.010	B	1	27-OCT-95	28811	L5440-14
LEAD, DISSOLVED	mg/L	7421	< 0.0030	0.0030	0.0030	U	1	26-OCT-95	28811	L5440-14
SELENIUM, DISSOLVED	mg/L	7740	< 0.0030	0.0030	0.0050	U	1	28-OCT-95	28811	L5440-14
THALLIUM, DISSOLVED	mg/L	7840	< 0.0040	0.0040	0.010	UN	1	27-OCT-95	28811	L5440-14

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGKN5 LAL Sample ID: L5440-12

Date Collected: 23-SEP-95 Date Received: 26-SEP-95

Matrix: Water Login Number: L5440

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	2.1	1.6	2.2		pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	6.5	1.7	2.2		pCi/L
Uranium	06-OCT-95	U TOTAL KPA (INORG)_27889	6.29	0.32	0.63		ug/L

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGKN5 LAL Sample ID: L5440-12

Date Collected: 23-SEP-95 Date Received: 26-SEP-95

Matrix: Water Login Number: L5440

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	2.1	1.6	2.2		pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	6.5	1.7	2.2		pCi/L
Uranium	06-OCT-95	U TOTAL KPA (INORG)_27889	6.29	0.32	0.63		ug/L

Lockheed Analytical Laboratory
Metals Analytical Data
Technical Review Checklist
(Analyst)

Analyst Name *(Print)*: PAUL LOCKS	Instrument: PERKIN ELMER 4PA-11	Method: V TOTAL ICPA

Batch Number	Client Name	Code Comments	Bench Sheet included Y/N	ACS updated Y/N
27885	BECHTEL HANFORD	COMPLETE	Y	Y

CODE ANOMALY
10 Prep Blank data was not within criteria
11 Laboratory Control Sample was not within criteria
12 Duplicate Precision was not met
13 Matrix Spike recovery was not within criteria
00 Other

Description	Yes	No	Comments
Completeness Review 1. Were the standard operating procedures (SOP) followed?	✓		
2. Are <u>all</u> raw data available and labeled properly (e.g., methods used, units, sample IDs, dilution factors, reruns)?	✓		
3. Are <u>all</u> abnormalities in the raw data noted and/or explained?	✓		
4. Were <u>all</u> the client samples analyzed for all constituents and QC as specified on the LAL Bench Sheets?	✓		
Data Quality Assessment 5. Was the sample properly preserved and analyzed within the method-specified holding time?	✓		
6. Were the instrument calibration criteria met?	✓		
7. Are the initial and continuing calibration verification samples data bracketing the samples of interest within criteria?	✓		
8. Are the bracketing initial and continuing calibration blank data within criteria?	✓		
9. *For ICP Only:* Are the interference check standard recovery data within criteria?			

Notes and comments:

I certify, to the best of my knowledge, that the data are acceptable and in compliance with the laboratory policies and client requests, except as noted above.

10/06/95
Analyst Signature/Date

10/10/95
Sujauna Mitchell-Hale
Secondary Reviewer Initials/Date

Lockheed Analytical Laboratory

Sample Preparation Worksheet for Total Uranium (KPA) Analysis

000043

Date Prep Started : 10/04/95 Matrix : Water

Workgroup Number : U TOTAL KPA (INORG) 27889 Prep Due Date : 31-Oct-95

CLIENT ID	LAL ID		QC	ALIQUOT (mL or g sample)	DILUTION	COMMENTS	Client	Collection Date
L5440-12	27889DUP1	1	DUP1	10	1x	RPD: 5.1% REF: 0.49	DUP	09/29/95
Lab Ctrl Sample	27889LCS1	2	LCS1		1x	REC: 112%	LCS	09/29/95
Method Blank	27889MBB1	3	MBB1		1x		MB	09/29/95
L5440-12	27889MS1	4	MS1		1x	REC: 103%	MS	09/29/95
BOGKN5	L5440-12	5	SMP1,MSS1		1x		Bechtel Hanford, Inc. *	09/23/95
		6						
		7						
		8						
		9						
		10						
		11						
		12						
		13						
		14						
		15						
		16						
		17						
		18						
		19						
		20						
		21						
		22						
		23						
		24						

COMMENTS:

Amount of CCV	1x	1x	Amount of LCS	0.1-L5 (10ppm)	Amount of MS	0.1-L5 (10ppm)	
CCV Activity	100 ug/L	5 ug/L	LCS Activity	100 ppb	MS Activity	100 ppb	
CCV ID#			LCS ID#		MS ID#		

Balance Number : — ( ) Pipette Number : ( ) Tracer, LCS, & MS added by:

( ) ( ) Witnessed by :

Sample Prep Analyst : 10/04/95 Checked by :

RADIATION RESULTS CHECK REPORT

Workgroup Number: U TOTAL KPA (INORG)_27889

Sample	Parameter	Value	Error	MDA
27889DUP1	Uranium	5.97504	0.308021	0.634
27889LCS1	Uranium	111.841	6.54819	0.634
27889MBB1	Uranium	-0.0439651	0.00234615	0.634
27889MS1	Uranium	109.746	6.41925	0.634
L5440-12	Uranium	6.28828	0.324168	0.634

ug/L

Lockheed Analytical Laboratory

Uranium Total by KPA (0168)

U TOTAL KPA (INORG)_27889

V95234

LALID	Count Date	Nuclide	Final Activity	Total Error	MDA	Count Error	Aliqout (mL)	Dilution Factor
					0.634			
27889DUP1	10/06/95	Uranium	5.975	0.308	0.634	0.075	10	1
27889LCS1	10/06/95	Uranium	111.841	6.548	0.634	3.407	10	1
27889MBB1	10/06/95	Uranium	-0.044	0.002	0.634	0.001	10	1
27889MS1	10/06/95	Uranium	109.746	6.419	0.634	3.331	10	1
L5440-12	10/06/95	Uranium	6.288	0.324	0.634	0.079	10	1

LCS Recovery = 111.8/100.0 = 111.8%. MS1 Recovery = 103.458/100.000 = 103.5 SMP1,DUP1 RER = 0.50, RPD = 5.1 %.

Lockheed Analytical Laboratory

Method Detection Concentration (MDC) Worksheet

Total U by KPA

Aqueous Matrix

Date	Batch #	Method Blank ug/L
10/6/95 8:57:51 AM	27889	-0.04397
10/4/95 4:13:56 PM	27683	-0.04138
9/18/95	26757	-0.0215
9/14/95	27052	0.0351
9/14/95	26756	0.0399
9/14/95	27355	0.0385
9/8/95 8:28:39 AM	26576	-0.01937
9/8/95	26755	-0.201
9/7/95 11:56:37 AM	26755	0.0636
9/7/95 9:53:42 AM	26476	0.07079
9/6/95 2:08:53 PM	26475	0.10922
8/29/95 10:44:05 AM	25666	-0.10535
8/24/95	16826228	-0.0424
8/23/95	16826123	-0.0818
8/19/95	16826424	0.
8/15/95 6:40:30 PM	26117	0.
8/15/95	16826045	0.
8/9/95	16825940	0.436
8/9/95	16825829	0.
8/9/95	16826051	0.295

10/06/95

Method Blank Average = 0.02657

Standard Deviation = 0.13626

MDC = 0.63361 ug/L

MDC = 4.65 * Standard Deviation

National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 3164

Spectrometric Standard Solution

Uranium

Batch Code 390709

This Standard Reference Material (SRM) is intended for use in atomic absorption spectrometry, optical emission (plasma) spectrometry, spectrophotometry, or any other analytical technique that requires aqueous standard solutions for calibrating instruments. SRM 3164 is a single element solution prepared gravimetrically to contain 10 mg/mL of uranium with a nitric acid concentration (V/V) of 10 percent. The certified value is based on a gravimetric procedure, i.e., weight per volume composition of the high-purity uranium oxide dissolved in NIST high-purity reagents. The uncertainty listed is based on gravimetric and volumetric uncertainties of the preparation and the effect of solvent transpiration through the container walls for one year after the bottle is removed from the plastic sleeve.

Metal	Concentration (mg/mL)	Source Purity, %	Acid Conc. (V/V) Approximate
U	10.00 ± 0.03	NBL-CRM 129 (99.968%) (formerly SRM 950b)	HNO_3, 10%

Procedures for Use

Stability: This certification is valid for one year from the date of shipment from NIST provided the solutions are kept tightly capped and stored under normal laboratory conditions. NIST will monitor the stability of representative solutions from this SRM lot and if changes occur that invalidate this certification, NIST will notify purchasers.

Preparation of Working Standard Solutions: All solutions should be brought to 22 ± 1 °C and all glass or plastic surfaces coming into contact with the standard must have been previously cleaned. A working standard solution can be prepared from the SRM solution by serial dilution. Dilutions should be made with certified volumetric class A flasks and 5 or 10 mL class A pipets. All volumetric transfers of solutions should be performed using a proven analytical technique. Each dilution should be acidified with an appropriate high-purity acid and diluted to calibrated volume using high-purity water. The stability of the working standard solution will depend on the final acid concentration; therefore, care should be exercised to ensure that the final acid concentration of the dilution closely approximates that of the SRM. To achieve the highest accuracy, the analyst should prepare daily working solutions from 100 µg/mL dilutions of the original SRM solution.

SRM 3164 was prepared by T.A. Butler of the NIST Inorganic Analytical Research Division. Inductively coupled plasma emission spectrometric analyses were made by T.A. Butler and L.J. Wood.

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.S. Kane.

Gaithersburg, MD 20899
October 5, 1993

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

LOCKHEED ANALYTICAL SERVICES

GC/MS FOR VOLATILE ORGANICS
8240 VOLATILES

Client Sample ID:	BOGKN5	LAL Sample ID:	L5440-2
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	02-OCT-95	Analytical Dilution:	1
Matrix:	Water	Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	100	84-122
Toluene-d8	108	87-117
Bromofluorobenzene	102	83-118

CONSTITUENT	CAS NO.	RESULT ug/L	PRACTICAL QUANTITATION LIMIT ug/L	DATA QUALIFIER(S)
Chloromethane	74-87-3	<5.0	5.0	
Vinyl Chloride	75-01-4	<5.0	5.0	
Bromomethane	74-83-9	<5.0	5.0	
Chloroethane	75-00-3	<5.0	5.0	
Trichlorofluoromethane	75-69-4	<5.0	5.0	
Acetone	67-64-1	<10.	10.	
1,1-Dichloroethene	75-35-4	<5.0	5.0	
Carbon Disulfide	75-15-0	<5.0	5.0	
Methylene Chloride	75-09-2	<5.0	5.0	
trans-1,2-Dichloroethene	156-60-5	<5.0	5.0	
Vinyl Acetate	108-05-4	<10.	10.	
1,1-Dichloroethane	75-34-3	<5.0	5.0	
2-Butanone	78-93-3	<10.	10.	
cis-1,2-Dichloroethene	156-59-2	<5.0	5.0	
Chloroform	67-66-3	<5.0	5.0	
1,1,1-Trichloroethane	71-55-6	<5.0	5.0	
Carbon tetrachloride	56-23-5	<5.0	5.0	
1,2-Dichloroethane	107-06-2	<5.0	5.0	
Benzene	71-43-2	<5.0	5.0	
Trichloroethene	79-01-6	<5.0	5.0	
1,2-Dichloropropane	78-87-5	<5.0	5.0	
Bromodichloromethane	75-27-4	<5.0	5.0	
2-Chloroethylvinylether	110-75-8	<20.	20.	
4-Methyl-2-Pentanone	108-10-1	<10.	10.	
cis-1,3-Dichloropropene	10061-01-5	<5.0	5.0	
Toluene	108-88-3	<5.0	5.0	
trans-1,3-Dichloropropene	10061-02-6	<5.0	5.0	
2-Hexanone	591-78-6	<10.	10.	
1,1,2-Trichloroethane	79-00-5	<5.0	5.0	
Tetrachloroethene	127-18-4	<5.0	5.0	
Dibromochloromethane	124-48-1	<5.0	5.0	
Chlorobenzene	108-90-7	<5.0	5.0	
Ethylbenzene	100-41-4	<5.0	5.0	
m,p-Xylene	1330-20-7	<5.0	5.0	
o-Xylene	95-47-6	<5.0	5.0	
Styrene	100-42-5	<5.0	5.0	
Bromoform	75-25-2	<5.0	5.0	
1,1,2,2-Tetrachloroethane	79-34-5	<5.0	5.0	
1,3-Dichlorobenzene	541-73-1	<5.0	5.0	
1,4-Dichlorobenzene	106-46-7	<5.0	5.0	
1,2-Dichlorobenzene	95-50-1	<5.0	5.0	

LOCKHEED ANALYTICAL SERVICES

GC/MS FOR VOLATILE ORGANICS
8240 VOLATILES

Client Sample ID:	BOGKN7	LAL Sample ID:	L5440-5
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	03-OCT-95	Analytical Dilution:	1
Matrix:	Water	Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	101	84-122
Toluene-d8	106	87-117
Bromofluorobenzene	101	83-118

CONSTITUENT	CAS NO.	RESULT ug/L	PRACTICAL QUANTITATION LIMIT ug/L	DATA QUALIFIER(S)
Chloromethane	74-87-3	<5.0	5.0	
Vinyl Chloride	75-01-4	<5.0	5.0	
Bromomethane	74-83-9	<5.0	5.0	
Chloroethane	75-00-3	<5.0	5.0	
Trichlorofluoromethane	75-69-4	<5.0	5.0	
Acetone	67-64-1	<10.	10.	
1,1-Dichloroethene	75-35-4	<5.0	5.0	
Carbon Disulfide	75-15-0	<5.0	5.0	
Methylene Chloride	75-09-2	<5.0	5.0	
trans-1,2-Dichloroethene	156-60-5	<5.0	5.0	
Vinyl Acetate	108-05-4	<10.	10.	
1,1-Dichloroethane	75-34-3	<5.0	5.0	
2-Butanone	78-93-3	<10.	10.	
cis-1,2-Dichloroethene	156-59-2	<5.0	5.0	
Chloroform	67-66-3	<5.0	5.0	
1,1,1-Trichloroethane	71-55-6	<5.0	5.0	
Carbon tetrachloride	56-23-5	<5.0	5.0	
1,2-Dichloroethane	107-06-2	<5.0	5.0	
Benzene	71-43-2	<5.0	5.0	
Trichloroethene	79-01-6	<5.0	5.0	
1,2-Dichloropropane	78-87-5	<5.0	5.0	
Bromodichloromethane	75-27-4	<5.0	5.0	
2-Chloroethylvinylether	110-75-8	<20.	20.	
4-Methyl-2-Pentanone	108-10-1	<10.	10.	
cis-1,3-Dichloropropene	10061-01-5	<5.0	5.0	
Toluene	108-88-3	<5.0	5.0	
trans-1,3-Dichloropropene	10061-02-6	<5.0	5.0	
2-Hexanone	591-78-6	<10.	10.	
1,1,2-Trichloroethane	79-00-5	<5.0	5.0	
Tetrachloroethene	127-18-4	<5.0	5.0	
Dibromochloromethane	124-48-1	<5.0	5.0	
Chlorobenzene	108-90-7	<5.0	5.0	
Ethylbenzene	100-41-4	<5.0	5.0	
m,p-Xylene	1330-20-7	<5.0	5.0	
o-Xylene	95-47-6	<5.0	5.0	
Styrene	100-42-5	<5.0	5.0	
Bromoform	75-25-2	<5.0	5.0	
1,1,2,2-Tetrachloroethane	79-34-5	<5.0	5.0	
1,3-Dichlorobenzene	541-73-1	<5.0	5.0	
1,4-Dichlorobenzene	106-46-7	<5.0	5.0	
1,2-Dichlorobenzene	95-50-1	<5.0	5.0	

LOCKHEED ANALYTICAL SERVICES

SPIKED SAMPLE RESULT
GC/MS FOR VOLATILE ORGANICS

Client Sample ID:	BOGKN7	LAL Sample ID:	28098MS
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	03-OCT-95	Analytical Dilution:	1
		Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	103	84-122
Toluene-d8	104	87-117
Bromofluorobenzene	103	83-118

CONSTITUENT	CAS NO.	RESULT ug/L	PRACTICAL QUANTITATION LIMIT ug/L	DATA QUALIFIER(S)
Chloromethane	74-87-3	<5.0	5.0	
Vinyl Chloride	75-01-4	<5.0	5.0	
Bromomethane	74-83-9	<5.0	5.0	
Chloroethane	75-00-3	<5.0	5.0	
Trichlorofluoromethane	75-69-4	<5.0	5.0	
Acetone	67-64-1	<10.	10.	
1,1-Dichloroethene	75-35-4	37.	5.0	
Carbon Disulfide	75-15-0	<5.0	5.0	
Methylene Chloride	75-09-2	<5.0	5.0	
trans-1,2-Dichloroethene	156-60-5	<5.0	5.0	
Vinyl Acetate	108-05-4	<10.	10.	
1,1-Dichloroethane	75-34-3	<5.0	5.0	
2-Butanone	78-93-3	<10.	10.	
cis-1,2-Dichloroethene	156-59-2	<5.0	5.0	
Chloroform	67-66-3	<5.0	5.0	
1,1,1-Trichloroethane	71-55-6	<5.0	5.0	
Carbon tetrachloride	56-23-5	<5.0	5.0	
1,2-Dichloroethane	107-06-2	<5.0	5.0	
Benzene	71-43-2	48.	5.0	
Trichloroethene	79-01-6	43.	5.0	
1,2-Dichloropropane	78-87-5	<5.0	5.0	
Bromodichloromethane	75-27-4	<5.0	5.0	
2-Chloroethylvinylether	110-75-8	<20.	20.	
4-Methyl-2-Pentanone	108-10-1	<10.	10.	
cis-1,3-Dichloropropene	10061-01-5	<5.0	5.0	
Toluene	108-88-3	49.	5.0	
trans-1,3-Dichloropropene	10061-02-6	<5.0	5.0	
2-Hexanone	591-78-6	<10.	10.	
1,1,2-Trichloroethane	79-00-5	<5.0	5.0	
Tetrachloroethene	127-18-4	<5.0	5.0	
Dibromochloromethane	124-48-1	<5.0	5.0	
Chlorobenzene	108-90-7	52.	5.0	
Ethylbenzene	100-41-4	<5.0	5.0	
m,p-Xylene	1330-20-7	<5.0	5.0	
o-Xylene	95-47-6	<5.0	5.0	
Styrene	100-42-5	<5.0	5.0	
Bromoform	75-25-2	<5.0	5.0	
1,1,2,2-Tetrachloroethane	79-34-5	<5.0	5.0	
1,3-Dichlorobenzene	541-73-1	<5.0	5.0	
1,4-Dichlorobenzene	106-46-7	<5.0	5.0	
1,2-Dichlorobenzene	95-50-1	<5.0	5.0	

LOCKHEED ANALYTICAL SERVICES

SPIKED SAMPLE RESULT
GC/MS FOR VOLATILE ORGANICS

Client Sample ID:	BOGKN7	LAL Sample ID:	28098MSD
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	03-OCT-95	Analytical Dilution:	1
		Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	102	84-122
Toluene-d8	107	87-117
Bromofluorobenzene	105	83-118

CONSTITUENT	CAS NO.	RESULT ug/L	PRACTICAL QUANTITATION LIMIT ug/L	DATA QUALIFIER(s)
Chloromethane	74-87-3	<5.0	5.0	
Vinyl Chloride	75-01-4	<5.0	5.0	
Bromomethane	74-83-9	<5.0	5.0	
Chloroethane	75-00-3	<5.0	5.0	
Trichlorofluoromethane	75-69-4	<5.0	5.0	
Acetone	67-64-1	<10.	10.	
1,1-Dichloroethene	75-35-4	37.	5.0	
Carbon Disulfide	75-15-0	<5.0	5.0	
Methylene Chloride	75-09-2	<5.0	5.0	
trans-1,2-Dichloroethene	156-60-5	<5.0	5.0	
Vinyl Acetate	108-05-4	<10.	10.	
1,1-Dichloroethane	75-34-3	<5.0	5.0	
2-Butanone	78-93-3	<10.	10.	
cis-1,2-Dichloroethene	156-59-2	<5.0	5.0	
Chloroform	67-66-3	<5.0	5.0	
1,1,1-Trichloroethane	71-55-6	<5.0	5.0	
Carbon tetrachloride	56-23-5	<5.0	5.0	
1,2-Dichloroethane	107-06-2	<5.0	5.0	
Benzene	71-43-2	54.	5.0	
Trichloroethene	79-01-6	44.	5.0	
1,2-Dichloropropane	78-87-5	<5.0	5.0	
Bromodichloromethane	75-27-4	<5.0	5.0	
2-Chloroethylvinylether	110-75-8	<20.	20.	
4-Methyl-2-Pentanone	108-10-1	<10.	10.	
cis-1,3-Dichloropropene	10061-01-5	<5.0	5.0	
Toluene	108-88-3	49.	5.0	
trans-1,3-Dichloropropene	10061-02-6	<5.0	5.0	
2-Hexanone	591-78-6	<10.	10.	
1,1,2-Trichloroethane	79-00-5	<5.0	5.0	
Tetrachloroethene	127-18-4	<5.0	5.0	
Dibromochloromethane	124-48-1	<5.0	5.0	
Chlorobenzene	108-90-7	54.	5.0	
Ethylbenzene	100-41-4	<5.0	5.0	
m,p-Xylene	1330-20-7	<5.0	5.0	
o-Xylene	95-47-6	<5.0	5.0	
Styrene	100-42-5	<5.0	5.0	
Bromoform	75-25-2	<5.0	5.0	
1,1,2,2-Tetrachloroethane	79-34-5	<5.0	5.0	
1,3-Dichlorobenzene	541-73-1	<5.0	5.0	
1,4-Dichlorobenzene	106-46-7	<5.0	5.0	
1,2-Dichlorobenzene	95-50-1	<5.0	5.0	

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DATA SUMMARY
GC/MS FOR VOLATILE ORGANICS

Client Sample ID:	BOGKN7	LAL Sample ID:	28098MS
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	03-OCT-95	Analytical Dilution:	1
		Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	103	84-122
Toluene-d8	104	87-117
Bromofluorobenzene	103	83-118

Constituent	Spike Added ug/L	Sample Concentration ug/L	MS Concentration ug/L	% Recovery	QC Limits % Recovery
1,1-Dichloroethene	50.0	0.000	36.8	74	62-124
Benzene	50.0	0.000	48.5	97	68-128
Trichloroethene	50.0	0.000	43.0	86	65-125
Toluene	50.0	0.315	48.8	97	69-129
Chlorobenzene	50.0	0.000	51.6	103	68-128

LOCKHEED ANALYTICAL SERVICES

MATRIX SPIKE DUPLICATE DATA SUMMARY
GC/MS FOR VOLATILE ORGANICS

Client Sample ID:	BOGKN7	LAL Sample ID:	28098MSD
Date Collected:	23-SEP-95	Date Received:	26-SEP-95
Date Analyzed:	03-OCT-95	Analytical Dilution:	1
		Analytical Batch ID:	100295-8260-E2
		Preparation Dilution:	1.00

SURROGATE RECOVERY (%)		
		QC Limits
1,2-Dichloroethane-d4	102	84-122
Toluene-d8	107	87-117
Bromofluorobenzene	105	83-118

Constituent	Spike Added ug/L	MSD Concentration ug/L	% Recovery	RPD	QC Limits RPD	QC Limits % Recovery
1,1-Dichloroethene	50.0	36.7	73	0	14	62-124
Benzene	50.0	54.3	109	11	11	68-128
Trichloroethene	50.0	43.6	87	2	14	65-125
Toluene	50.0	49.4	98	1	13	69-129
Chlorobenzene	50.0	53.7	107	4	13	68-128

LOCKHEED ANALYTICAL SERVICES

RAD DATA REPORT (ra01)

Bechtel Hanford, Inc. * Richland, WA

Bechtel Hanford Project (Project BECHTEL-HANFORD)

Client Sample ID: BOGKN5 LAL Sample ID: L5440-12

Date Collected: 23-SEP-95 Date Received: 26-SEP-95

Matrix: Water Login Number: L5440

Constituent	Analyzed	Batch	Activity	Error	MDA	DataQual	Units
Gross Alpha	11-OCT-95	GR ALP/BETA LAL-0060_27812	2.1	1.6	2.2		pCi/L
Gross Beta	11-OCT-95	GR ALP/BETA LAL-0060_27812	6.5	1.7	2.2		pCi/L
Uranium	06-OCT-95	U TOTAL KPA (INORG)_27889	6.29	0.32	0.63		ug/L

RADIATION RESULTS CHECK REPORT

Workgroup Number: GR ALP/BETA LAL-0060_27812

Sample	Parameter	Value	Error	MDA
27812DUP1	Gross Alpha	0.0146056	2.97087	6.16435
27812LCS1	Gross Alpha	41.0937	4.77935	1.57387
27812MBB1	Gross Alpha	0.700113	0.695432	1.08298
27812MS1	Gross Alpha	82.0275	13.0683	5.8528
L5379-12	Gross Alpha	1.7533	3.20938	5.75075
L5440-12	Gross Alpha	2.05197	1.57114	2.20882
27812DUP1	Gross Beta	10.352	3.48101	4.97015
27812LCS1	Gross Beta	41.9867	3.64313	2.12547
27812MBB1	Gross Beta	0.570641	1.19384	2.03893
27812MS1	Gross Beta	103.728	8.84446	5.14088
L5379-12	Gross Beta	7.94663	3.42358	5.1305
L5440-12	Gross Beta	6.47903	1.65388	2.18383

Lockheed
Engineering & Sciences Company

INTERDEPARTMENTAL COMMUNICATION

DATE August 08, 1994

TO	Document Control	DEPT./ ORGN.		BLDG./ ZONE	BLDG 9	PLANT/ FAC.	
FROM	Carl Schloesslin	DEPT./ ORGN.	5014	BLDG./ ZONE	LAS	PLANT/ FAC.	EXT. 242

CS

SUBJECT: Tennelec LB4000.1 (LB1) Gross Alpha Calibration

Attached is calibration data of Americium-241 for gross alpha analysis by gas proportional counting. This calibration was performed during July 12-15, 1994 CP 2/2/95 on the LB4000.1 GPC. The results of this calibration is to be put in use beginning August 08, 1994 and continue until a new calibration is performed and approved.

Each calibration standard was counted in each detector long enough to acquire at least 10,000 counts. Data regression techniques were used to produce a quadratic-exponential fit of each detector's attenuation curve (efficiency curve). A normalization factor was determined for each detector to relate each detector to detector A1. Multiplying the efficiency determined from the attenuation curve for detector A1 by the normalization factor for the detector in use produces a result within 1% of the actual efficiency of that detector. Thus, a common absorption curve equation may be used for all detectors. This equation is:

$$\text{Efficiency} = \text{Exp}\ (11.284 * wt^2 - 10.158 * wt - 1.525)$$

The normalization factor determined for each detector is:

A1	1.0000	B1	1.0149	C1	1.0007	D1	1.0087
A2	1.0530	B2	1.0272	C2	0.9871	D2	1.0007
A3	1.0653	B3	1.0521	C3	0.9875	D3	1.0144
A4	1.0710	B4	1.0656	C4	0.9796	D4	1.0145

The alpha into beta crosstalk equation used for each of the detectors is:

$$\text{Crosstalk Factor} = \text{Exp}\ (21.717 * wt^2 - 1.612 * wt - 1.355)$$

This calibration is valid for sample weights of 0.1 mg to 146.7 mg.

A copy of this data package should be kept on file in document control with previous radiochemistry calibrations of the Tennelec LB4000 gas proportional counter for gross alpha analysis.

Approved by:

Russ Stimmel, Supervisor 8/8/94

FORM LESC426-2

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PROJECT Am-241

Notebook No. 1 7

Continued From Page

SECONDARY / WORKING LEVEL STANDARD DILUTION RECORD

MS 7/14/94

Dilution Source Information

Isotope:	Am-241
From NIST traceable standard?:	YES.
Vendor or Certificate I.D. # of parent standard:	~~[91-0225-60-1]~~ MS 7/14/94 388-40-1
Diluted source logbook I.D. #:	91-0225-60-1
Balance verification?:	ROUTINE CHECK
Diluent used:	0.5 M HCl

Dilution

*Diluent:	1 M HCl
*Density of diluent (g/ml):	NA
a. Parent standard activity:	9,810 Pa/mL
b. Amount of standard transferred:	6.0 mL
c. Total amount of dilution:	50.0 mL
d. Activity of dilution [a * b / c]:	1,177.2 Pa/mL
Dilution logbook I.D. #:	LM-93-106-0474-86

Prepared by: N. Nuyen — Preparation date: 7/7/94

Reviewed by: Joe Hutchison — Review date: 7/26/94

*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

LAL-91-SOP-0174

Continued on Page

Read and Understood By

Signed	Date	Signed	Date

5/d. Diluted to 100 ml to make 91-6225-60-1 MAWW50

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 μCi.

Description of Solution

a. Mass of solution:	5.0007	grams.
b. Chemical form:	$AmCl_3$ in 0.5N HCl	
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

Radioimpurities

None detected

Radioactive Daughters

None detected

Radionuclide Concentration

0.1994 μCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±0.7%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

Gary A Gilmore
QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

LB4000.1 Am-241 Gross Alpha Calibration Data (Filename gacal193.lb1)

ID	Desc	Count Time	Alpha Counts	Beta Counts	Hi Voltage	Time	Date	CPM Alpha	CPM Beta	EFF Alpha	EFF Beta	Net Weight	A>>B X-Talk	EFF Fit (qd-exp)	X-T Fit (qd-exp)
A1	ACAL01	25	0	24	1417.5	14:06:25	7-12-94	0.00	0.96	0.0000	0.0000	0.0010			
A1	ACAL14	25	12947	4934	1417.5	13:06:32	7-13-94	517.88	197.36	0.1990	0.0755	0.0001	0.3792	0.2173	0.2579
A1	ACAL02	25	14521	3695	1417.5	14:41:54	7-14-94	580.84	147.80	0.2232	0.0564	0.0090	0.2528	0.1987	0.2546
A1	ACAL03	25	11434	2909	1417.5	13:52:40	7-14-94	457.36	116.36	0.1758	0.0444	0.0188	0.2523	0.1804	0.2521
A1	ACAL04	25	11807	3006	1417.5	13:24:15	7-14-94	472.28	120.24	0.1815	0.0458	0.0190	0.2526	0.1801	0.2521
A1	ACAL05	25	9909	2343	1417.5	12:29:47	7-14-94	396.36	93.72	0.1523	0.0356	0.0374	0.2340	0.1512	0.2503
A1	ACAL06	25	8523	2047	1417.5	12:02:21	7-14-94	340.92	81.88	0.1310	0.0311	0.0555	0.2374	0.1282	0.2521
A1	ACAL07	25	7210	1930	1417.5	11:24:13	7-14-94	288.40	77.20	0.1108	0.0293	0.0738	0.2644	0.1093	0.2577
A1	ACAL08	25	7008	1799	1417.5	10:50:44	7-14-94	280.32	71.96	0.1077	0.0273	0.0739	0.2533	0.1092	0.2578
A1	ACAL09	25	5435	1528	1417.5	16:53:15	7-13-94	217.40	61.12	0.0836	0.0231	0.0931	0.2767	0.0932	0.2679
A1	ACAL10	25	5319	1487	1417.5	15:51:27	7-13-94	212.76	59.48	0.0818	0.0225	0.1070	0.2751	0.0835	0.2783
A1	ACAL11	25	4838	1442	1417.5	15:18:33	7-13-94	193.52	57.68	0.0744	0.0218	0.1284	0.2931	0.0711	0.3000
A1	ACAL12	25	5221	1527	1417.5	14:50:59	7-13-94	208.84	61.08	0.0803	0.0231	0.1283	0.2879	0.0712	0.2998
A1	ACAL13	25	3770	1299	1417.5	14:00:15	7-13-94	150.80	51.96	0.0580	0.0196	0.1467	0.3382	0.0625	0.3249

Efficiency Regression Output:

Constant		-1.5253
Std Err of Y Est		0.07579
R Squared		0.97426
No. of Observations		13
Degrees of Freedom		10
X Coefficient(s)	-10.1580	11.2837
Std Err of Coef.	1.6846	11.3911

X-T Regression Output:

Constant		-1.3552
Std Err of Y Est		0.0293
R Squared		0.9239
No. of Observations		10
Degrees of Freedom		7
X Coefficient(s)	-1.6119	21.7165
Std Err of Coef.	0.8114	5.3127

Regressions for all efficiency curves & the A1 crosstalk curve are quadratic exponential fits.

ACAL14, ACAL05, & ACAL06 ware not used for the crosstalk curve – poor data points.

Am-241 standard is 1.0 mL of LAL-93-LOG-474-86, 2602 dpm/mL on date of calibration.

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PROJECT Sr-90 Notebook No. _____

Continued From Page _____

INITIAL STANDARD DILUTION RECORD

Standard Information:			
Isotope:	Sr-90	Vendor:	EPA
Activity of Standard Received:	2.7×10^4 uCi	Vendor I.D. #	94003-1
Weight of Standard Received (g):	50 g	LAL I.D. #:	AC5281
Standard Activity (pCi/g):	5.4×10^3 pCi/g	NIST Traceable ?	yes
Halflife in Years or Days:	28.6 yrs	Certificate #:	94003-1
Reference Date:	4-1-1994	Receiver's Name:	K Free
		Date Received:	5-3-94

Primary Dilution		
Balance Verification?:	yes	
Diluent Used:	0.1M HCl	
a: Decay Corrected Standard Activity (pCi/g):	5.4×10^3	pCi/g
b: Weight of the Source Transferred (g):	4.9670	g
c: Total diluted weight (g):	49.91	g
d: Total Diluted Volume (mL)	50	mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	537.4	pCi/g
f: Calculated Density of Solution (g/ml) [c / d]:	0.9982	g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	536.44	pCi/mL
h. Dilution Logbook I.D. #:	93-474-81-1	

Prepared By: Agnes Wong Preparation Date: 6-15-94

Reviewed By: Joe Hutchison Review Date: 6/30/94

Purity/Cross Check Performed By: _____ Check Date: _____

Signed	Date	Signed	Date

Rcvd 5/31/94
ACS 851
RKS

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Strontium-90 — Half-life: 28.6 years

Nominal activity: 27 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 94003-1

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40 nano curies of Strontium-90

at 0400 hours PST on April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 nano curies Per gram

of the daughter nuclide Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life

This radionuclide has decayed through 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after August 1994

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

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LOCKHEED ANALYTICAL LABORATORY

BETA ACTIVITY CALCULATIONS FOR GROSS ALPHA/BETA ANALYSIS

SOP-LAL-91-0060

LAL PREP NO: Calibration Check

PARENT LAL ID	DET	PLANCHET LAL ID	CTIME (min)	COUNTS BETA	COUNTS BETA BKG	EFF BETA	ACTIVITY BETA (pCi/L)	CNT ERR 2 SIGMA (pCi/L)	TTL ERR 2 SIGMA (pCi/L)	MDA BETA (pCi/L)	FLAGS	COUNT DATE
	D3	GABCHK1	30	16563	29.6	0.420	528.38	9.02	27.92	1.00	*	8/03/94
	B1	GABCHK1	30	16380	30.4	0.420	521.86	8.98	27.60	1.01	*	8/03/94
	A3	GABCHK1	30	16749	28.6	0.430	520.33	8.86	27.48	0.96	*	8/03/94
	C2	GABCHK1	30	15890	28.5	0.412	515.80	9.00	27.32	1.00	*	8/03/94
	C3	GABCHK2	30	14898	30.3	0.412	505.63	8.72	26.74	1.03	*	8/03/94
	D1	GABCHK2	30	14913	30.9	0.413	507.56	8.71	26.83	1.04	*	8/03/94
	B2	GABCHK2	30	14878	29.4	0.420	495.90	8.55	26.23	1.00	*	8/03/94
	A2	GABCHK2	30	15206	28.4	0.422	502.34	8.60	26.55	0.98	*	8/03/94
	A1	GABCHK3	30	14541	29.3	0.394	530.62	9.01	28.02	1.06	*	8/03/94
	C4	GABCHK3	30	14643	28.5	0.393	538.37	9.08	28.41	1.05	*	8/03/94
	B3	GABCHK3	30	14949	30.1	0.408	526.96	8.82	27.79	1.04	*	8/03/94
	D4	GABCHK3	30	14053	26.9	0.368	547.90	9.48	28.99	1.09	*	8/03/94

Comments : Known beta spike is 531.8 pCi/L → Highest Recovery = 103%
Lowest Recovery = 93% → Average Recovery = 98%

run log (—) maint log (—) calibration (—) inst check (—) inst bkg (—) MBB (_) LCS (_) DUP (_) calcs (—)

Date Completed : 8-8-94

Anlst Signature : Carl Schroeder

Supervisor's Signature : T Howarko

PROJECT Gross Alpha/Beta LCS Continued From Page _____

SECONDARY/WORKING LEVEL STANDARD DILUTION RECORD

Dilution Source Information

Isotope:	Am-241 and Sr-90
Parent Barcode Number	AA0030 (Am-241) AA0046 (Sr-90)
Vendor or Certificate I.D. # of Parent Standard:	IPL 388-100-1 (Am-241) NIST SRM 4919G (Sr-90)
Diluted Source Logbook I.D. #:	91-0225-60-1 (Am-241) 91-0225-30-2 (Sr-90)
Balance Verification?:	Yes
Diluent Used:	0.1 N HNO_3

Dilution

*Diluent:	0.1 N HNO_3 + 42mg $Sr(NO_3)_2$/mL
*Density of diluent (g/ml):	NA
a: Parent Specific Activity:	Am-241 981 pCi/mL Sr-90 600 pCi/mL m 8/1/90
b: Amount of Source Transferred:	Am-241 0.5 mL Sr-90 0.5 ~~g~~ mL
c: Total amount of Dilution:	500 ~~g~~ mL
d: Total Volume of Dilution:	500 mL
e: Activity of Dilution [a * b / c]:	NA
f: Activity of Dilution (a * b / d):	Am-241 9.81 pCi/mL Sr-90 12 pCi/mL m 8/1/90
Dilution Logbook I.D. #:	95-721-13-1
Prepared By:	Joe Hutchinson
Preparation Date:	8/23/95
Reviewed By:	[illegible]
Review Date:	8/24/95

*If the diluent remains unchanged from the diluent used for the dilution source, then a weight dilution of a volume unit source can be performed without a density conversion. If the diluent changes, a weighted proportion density conversion is necessary.

Read and Understood By

Signed	Date	Signed	Date

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co.
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 µCi.

Description of Solution

a. Mass of solution:	5.0007	grams.
b. Chemical form:	AmCl3 in 0.5N HCl	
c. Carrier content:	None added	
d. Density:	1.0077	gram/ml @ 20°C.

Radioimpurities

None detected

Radioactive Daughters

None detected

Radionuclide Concentration

0.1994 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration:	±2.0%
b. Random uncertainty in assay:	±0.7%
c. Random uncertainty in weighing(s):	±0.0%
d. Total uncertainty at the 99% confidence level:	±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

Gary T. Gilmore
QUALITY CONTROL

ISOTOPE PRODUCTS LABORATORIES
1800 No. Keystone Street.,
Burbank, California 91504
(818) 843 - 7000

HA 00046

THIS IS A PHOTOCOPY OF THE CERTIFICATE WHICH IS BEING MAILED TO YOU UNDER SEPARATE COVER.

National Institute of Standards & Technology

Certificate

Standard Reference Material 4919-G
Radioactivity Standard

Radionuclide	Strontium-90
Source identification	4919-G
Source description	Solution in NIST borosilicate-glass ampoule (1)*
Solution composition	Strontium-90 plus yttrium-90 plus approximately 95 μg each of non-radioactive strontium and yttrium per gram of 1-molar hydrochloric acid (2)
Mass	Approximately 5.0 grams
Radioactivity concentration	4.514×10^3 Bq g^{-1}
Reference time	1200 EST August 1, 1990
Overall uncertainty	1.05 percent (3)
Photon-emitting impurities	None observed (4)
Alpha-particle-emitting impurities	None observed (5)
Half life	28.5 ± 0.2 years (6)
Measuring instrument	$4\pi\beta$ liquid-scintillation counter

This standard reference material was prepared in the Center for Radiation Research, Ionizing Radiation Division, Radioactivity Group, Dale D. Hoppes, Group Leader.

Gaithersburg, MD 20899
[illegible]uary, 1991

William P. Reed, Acting Chief
Office of Standard Reference Materials

*Notes on back

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> 1d. Diluted to 100 ml to make 91-0225-60-1 AA0030

CERTIFICATE OF CALIBRATION
ALPHA STANDARD SOLUTION

Radionuclide	Am-241	Customer:	LOCKHEED ENGINEERING & SCIENCES Co
Half Life:	432.7 ± 0.5 years	P.O.No.:	06LAB1245
Catalog No.:	7241	Reference Date:	November 1 1991 12:00 PST.
Source No.:	388-100-1	Contained Radioactivity:	0.997 µCi.

Description of Solution

a. Mass of solution: 5.0007 grams.

b. Chemical form: $AmCl_3$ in 0.5N HCl

c. Carrier content: None added

d. Density: 1.0077 gram/ml @ 20°C.

Radioimpurities

None detected

Radioactive Daughters

None detected

Radionuclide Concentration

0.1994 µCi/gram.

Method of Calibration

Weighed aliquots of the solution were assayed using a liquid scintillation counter.

Uncertainty of Measurement

a. Systematic uncertainty in instrument calibration: ±2.0%

b. Random uncertainty in assay: ±0.7%

c. Random uncertainty in weighing(s): ±0.0%

d. Total uncertainty at the 99% confidence level: ±2.7%

NIST Traceability

This calibration is implicitly traceable to the National Institute of Standards and Technology.

Notes

1. Nuclear data were taken from "Table of Isotopes", Seventh Edition, edited by Virginia S. Shirley.
2. IPL participates in an NIST measurement assurance program to establish and maintain implicit traceability for a number of nuclides, based on the blind assay(and later NIST certification) of Standard Reference Materials. (As in NRC Regulatory Guide 4.15)

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Rec'd 5/31/94
ACS 451
RKS

U.S. Environmental Protection Agency
Environmental Monitoring Systems Laboratory-Las Vegas
Nuclear Radiation Assessment Division

Calibration Certificate

Description

Principal radionuclide: Strontium-90 — Half-life: 28.6 years

Nominal activity: 27 nano curies

Nominal volume: 5 ml in ampoule/bottle number: 94003-1

Measurement Activity of principal radionuclide

Activity per gram of this solution

5.40 nano curies of Strontium-90

at 0400 hours PST on April 1, 1994

Activity of daughter radionuclide

The principal activity was accompanied at the quoted time by

5.40 nanocuries Per gram

of the daughter nuclide Yttrium-90

Total mass of this solution

Approximately 5.0 grams

Method of measurement

The activity of the primary solution was measured by liquid scintillation counting.

The activity of the dilution was measured by liquid scintillation counting.

Useful Life

This radionuclide has decayed through 0.0 half lives since it was obtained by EMSL-LV

We recommend that this solution should not be used after August 1994

This dilution was prepared for the 1994 ASTM Collaborative Study of a test method for the determination of Sr-90 in water.

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Purity

The manufacturer states that activities other than that of the principal nuclide and of its daughter nuclides, if any, were estimated/known to be.

(1)	less than equal to	%	of the principal activity
(2)	less than equal to	%	of the principal activity
(3)	less than equal to	%	of the principal activity

The activity of impurity (1) is not (2) is not (3) is not included in the quoted figures of the principal activity.

Random Errors

The precision of this standard was such that the certified value of the radioactive concentration of the principal activity had a standard error (sm) not greater than ± 0.1 %

(The 99.7% confidence limits are given by t(sm) where t is obtained from the student t factor for the degree of freedom (n-1)).

The maximum uncertainty due to the assessable systematic errors (dilution, counting, and known uncertainty of the standard) is obtained by the separate arithmetic summation of the positive and negative systematic error ($+\delta - \delta'$). These have been estimated not to exceed

+3.8 % or - 3.8 %

the overall uncertainty (often called accuracy) is an estimate of the possible divergence of the quoted result from the true value. It is a combination of random error [t(sm)] at the 99.7% confidence limits and the worst case estimate of the systematic errors ($+\delta, -\delta'$)
The overall uncertainty is therefore calculated on the basis of + [t(sm) $+\delta$], - [t(sm) $+\delta'$]
and is +4.0 %, - 4.0 % of the quoted radioactive concentration.

Decay Schemes

This standardization is based on the following assumptions of the principle nuclide, its daughter nuclides and impurities (no allowance for error in these assumptions or the assumption of quoted half-life have been included in the statement of accuracy above).

Strontium-90 decays 100 percent by beta emission to yttrium-90. Yttrium-90 also decays 100 percent by beta emission.

Chemical Composition of Solution

Carrier content per gram of solution:	Other components:
30 micrograms strontium	0.1 M HCl

Preservative:

Remarks

Date Certificate Prepared April 26, 1994

Approval Signature Paul B. Hahn

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Revised 1/84

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PROJECT Sr-90 Notebook No. 0474

Continued From Page _____

INITIAL STANDARD DILUTION RECORD

Standard Information:

Isotope:	Sr-90	Vendor:	EPA
Activity of Standard Received:	2.7×10^4 uCi	Vendor I.D. #	94003-1
Weight of Standard Received (g):	5.0 g	LAL I.D. #:	AC5281
Standard Activity (pCi/g):	5.4×10^3 pCi/g	NIST Traceable ?	yes
Halflife in Years or Days:	28.6 yrs	Certificate #:	94003-1
Reference Date:	4-1-1994	Receiver's Name:	K. Free
		Date Received:	5-3-94

Primary Dilution

Balance Verification?:	Yes
Diluent Used:	0.1M HCl
a: Decay Corrected Standard Activity (pCi/g):	5.4×10^3 pCi/g
b: Weight of the Source Transferred (g):	4.9670 g
c: Total diluted weight (g):	49.91 g
d: Total Diluted Volume (mL)	50 mL
e: Activity of Dilution by Weight (pCi/g) [a * b / c]:	537.4 pCi/g
f: Calculated Density of Solution (g/ml) [c / d]:	0.9982 g/mL
g: Activity of Dilution by Volume (pCi/mL) [e * f]:	536.44 pCi/mL
h. Dilution Logbook I.D. #:	~~93-474-81-1~~ 93-474-82-1 CP 4/7/95

Prepared By: Agnes Wong Preparation Date: 6-15-94

Reviewed By: Joe Hutcheson Review Date: 6/30/94

Purity/Cross Check Performed By: _____ Check Date: _____

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Signed	Date	Signed	Date